GOVERNMENT OF INDIA : THE PATENT OFFICE, 214, LOWER CIRCULAR ROAD, CALCUTTA-17.
Specification No. 97003, dated 14th December 1964. Complete Specification left on 14th September 1965. (Application accepted 4th July 1966.)
Index at acceptance—70C4[LVIII(5)].

# PROVISIONAL SPECIFICATION.

## IMPROVEMENTS IN OR RELATING TO THE ELECTROLYTIC PRODUCTION OF HIGH QUALITY FINE GRADE SILVER POWDER.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH, Rafi Marg, New Delhi 1, India an Indian Registered Body Incorporated under the Registration of Societies Act (Act XXI of 1960).

*The following specification describes the nature of this invention.*

This is an invention by Dr. Prem Behari Mathur and Nallagounder Karuppannan, both of the Central Electrochemical Research Institute, Karaikudi 3, S. Rly., India, both Indian Citizens

The usefulness of silver powder in the fabricated sintered silver plates employed in silver oxide-zinc and cadmium batteries, in fuel cells and as a catalyst in organic oxidation reactions etc , has enormously widened the scope of application of silver powder in chemical technology. The factors like the entrance of impurities or the production of unsuitable size particles or the complex steps involved in a process, impose restrictions on the use of various mechanical, chemical and other methods of preparations of silver powder. An electrolytic method for the production of fine grade silver powder useful for various applications has been described in this patent.

The method consists in electrolysing a solution containing a mixture of soluble silver salt such as silver nitrate, sodium or potassium nitrate and nitric acid—latter one to maintain the pH of the solution, within a certain range of current densities using stainless steel cathode and silver anode The powder deposit on the stainless steel cathode is removed periodically from the cathode in a porcelain or other material container. The collected powder is washed well with distilled water and is then dried in an oven and subsequently the lumps are crushed to powder in a pestle mortar and sieved as per requirement.

*Example .*

Take a mixture of silver nitrate and potassium nitrate in the ratio of 1 3 and add to it a few drops of nitric acid to render the pH of the solution acedic. In 16 litres of this solution dip a stainless steel cathode and silver anode. Pass the current Remove the cathode from the path periodically nearly at every two minutes and transfer the powder from the cathode into a porcelain trough. Wash well the collected powder with distilled water to remove the soluble electrolytes and dry it in oven between 110° to 120°C After drying crush the powder lumps in pestle mortar or in any other crusher and sieve according to the requirement.

A sample of the powder obtained under the controlled condition gave the following seive analysis .

| Mesh size | Percent present by weight |
|---|---|
| 100 | *Nil* |
| 140 | 1·25 |
| 170 | 5·80 |
| 200 | 1 10 |
| 240 | 0·23 |
| —240 | 91·64 |

*Summary*

(1) A process for the electrolytic production of fine grade silver powder on stainless steel cathode by the electrolysis of an acidic solution containing a soluble silver salt—such as silver nitrate—and alkali metal salt—the former being taken in lesser proportion than the latter.

R. Bhaskar Pai,
*Patents officer,*

*Council of Scientific & Industrial Research.*
*Dated this 11th day of December, 1964.*

# COMPLETE SPECIFICATION.

## IMPROVEMENTS IN OR RELATING TO THE ELECTROLYTIC PRODUCTION OF HIGH QUALITY FINE GRADE SILVER POWDER.

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, Rafi Marg, New Delhi-1, India, an Indian registered body incorporated under the Registration of Societies Act (Act XXI of 1860)

*The following specification particularly describes and ascertains the nature of this invention and the manner in which it is to be performed :—*

This is an invention by Dr. Prem Behari Mathur and Nallagounder Karuppannan, both of the Central Electrochemical Research Institute, Karaikudi 3, S. Rly., India, both Indian Citizens.

The usefulness of silver powder in the fabricated sintered silver plates employed in silver oxide zinc and cadmium batteries, in fuel cells and as a catalyst in organic oxidation reactions etc , has enormously widened the scope of application of silver powder in chemical technology. The factors like the entrance of impurities or the production of unsuitable size particles or the complex steps involved in a process, impose restrictions on the use of various mechanical, chemical and other methods of preparations of silver powder. An electrolytic method for the production of fine grade silver powder useful for various applications has been described in this patent.

The present invention consists of a process for the electrolytic production of fine grade silver powder on stainless steel cathode by the electrolysis of an acidic solution containing a soluble silver salt such as silver nitrate and alkali metal salt the former being taken in lesser proportion than the latter.

The method consists in electrolysing a solution containing a mixture of soluble silver salt such as silver nitrate, sodium or potassium nitrate and nitric acid—latter one to maintain the pH of the solution, within a certain range 10 Ampere per sq. ft. to 100 Amp. per sq ft. of current densities, using stainless steel cathode and silver anode. The powder deposit on the stainless steel cathode is removed periodically from the cathode in a porcelain or other material container. The collected powder is washed well with distilled water and is then dried in an oven and subsequently the lumps are crushed to powder in a pestle mortar and sieved as per requirement.

*Example :*

Take a mixture of silver nitrate and potassium nitrate in the ratio of 1 . 3 and add to it a few drops of nitric

acid to render the pH of the solution acidic. In 16 litres of this solution dip a stainless steel cathode and silver anode. Pass the current. Remove the cathode from the path periodically nearly at every two minutes and transfer the powder from the cathode into a porcelain trough. Wash well the collected powder with distilled water to remove soluble electrolytes and dry it in oven between 110° to 200°C. After drying crush the powder lumps in pestle mortar or any other crusher and sieve according to the requirement.

A sample of the powder obtained under the controlled condition gave the following sieve analysis :

| Mesh size | percent present by weight |
|---|---|
| 100 | *Nil* |
| 140 | 1·25 |
| 170 | 5·80 |
| 200 | 1·10 |
| 240 | 0·23 |
| —240 | 91·64 |

*We claim :*

1. A process for the electrolytic production of fine grade silver powder on stainless steel cathode by the electrolysis of an acidic solution containing a soluble silver salt—such as silver nitrate—and alkali metal salt—the former being taken in lesser proportion than the latter.

2. A process as claimed in Claim 1, wherein is used a solution containing a mixture of soluble silver salt such as silver nitrate, sodium or potassium nitrate and nitric acid—latter one to maintain the pH of the solution, within a certain range (10 Ampere per sq. ft. to 100 Amp. per sq. ft.) of current densities, using stainless steel cathode and silver anode.

3. A process as claimed in Claim 1 or 2, wherein the powder deposit on the stainless steel cathode is removed periodically from the cathode in a porcelain or other material container, the collected powder is washed well with distilled water and is then dried in an oven and subsequently the lumps are crushed to powder in a pestle mortar and sieved as per requirement.

4. A process for the electrolytic production of high quality fine grade silver powder substantially as hereinbefore described in the example.

5. Electrolytic high quality fine grade silver powder whenever obtained according to a process substantially as hereinbefore described.

R. Bhaskar Pai,

*Patents Officer,*

*Council of Scientific & Industrial Research.*

*Dated this 8th day of September, 1965.*

M IPC—S16—1 Patent/67—12-2-69—100.